



Fire Protection Training

Procedures Handbook 4300

SPECIAL INCIDENT

TOPIC: SAFETY PRECAUTIONS WHEN WORKING NEAR ENERGIZED ELECTRICAL EQUIPMENT

TIME FRAME: :30

LEVEL OF INSTRUCTION: Level II

BEHAVIORAL OBJECTIVE:

Condition: A written quiz

Behavior: The student will list and describe the safety hazards that may be encountered when working near energized electrical equipment.

Standard: With a minimum of 70% accuracy

MATERIALS NEEDED:

- Appropriate visual aids
- Audio visual equipment

REFERENCES:

- IFSTA, Fire Fighter Occupational Safety
- IFSTA, Essentials of Fire Fighting, 4th Edition
- CDF, Emergency Command Center, Procedures Handbook (8100) Procedure 2

PREPARATION: When firefighters respond to an alarm, they may encounter electrical hazards in various shapes and sizes. A relatively simple one-room fire in a single family dwelling may expose firefighters to 240 volt house current. A burning electrical substation may produce electrical arcing and explosions that will require evacuation. To deal safely with incidents that involve electricity, the firefighter must understand how to isolate, control or eliminate electrical hazards.

4331.2



Fire Protection Training

Procedures Handbook 4300

SAFETY PRECAUTIONS WHEN
WORKING NEAR ENERGIZED
ELECTRICAL EQUIPMENT

PRESENTATION	APPLICATION
<p>I. ELECTRIC HAZARDS</p> <p>A. Terminology</p> <ol style="list-style-type: none">Electricity can be measured in three different ways<ol style="list-style-type: none">Amperes (amps)Voltage (volts)OhmsFirefighters can often best understand these terms when compared to the terms we use to describe the flow of water. Water flow is measured by quantity (GPM), pressure (PSI) and resistance (friction loss)<ol style="list-style-type: none">Amps = Quantity of electricity = GPMVolts = Electrical pressure = PSIOhms – Resistance = Friction LossThe seriousness of electrical shock depends mostly on the amount of current (amps) that passes through the body<ol style="list-style-type: none">100 milliamperes or less can cause ventricular fibrillation100 – 200 milliamperes or more may be lethalGround gradient<ol style="list-style-type: none">The ground can be energized by downed electrical lines	<p>See Information Sheet #1</p>

4331.2



Fire Protection Training

Procedures Handbook 4300

SAFETY PRECAUTIONS WHEN
WORKING NEAR ENERGIZED
ELECTRICAL EQUIPMENT

PRESENTATION	APPLICATION
<ul style="list-style-type: none">(1) Tingling sensations in the feet are an indication that the ground maybe energizedb. The higher the voltage the greater the distance it will travel<ul style="list-style-type: none">(1) Voltage drops as it spreads away from the source(2) Safe area is the length of one pole to pole span away from the source as a rule of thumb <p>NOTE: See Information Sheet 2, Figure 1</p> <ul style="list-style-type: none">(a) 25' as a minimumc. The spread pattern the voltage travels in will be irregular and unpredictable due to ground moisture and other variables <p>5. Step potential</p> <p>NOTE: See Information Sheet 2, Figure 2</p> <ul style="list-style-type: none">6. As you walk across the ground, one foot may be in contact with a different voltage than the other foot<ul style="list-style-type: none">a. Current flows through the human body easier than through the groundb. Current will follow the path of least resistance from one foot through the body to the other foot <p>B. Size Up</p> <ul style="list-style-type: none">1. Upon arrival at any emergency scene, the first task to be performed is size up	

4331.2



Fire Protection Training

Procedures Handbook 4300

SAFETY PRECAUTIONS WHEN
WORKING NEAR ENERGIZED
ELECTRICAL EQUIPMENT

PRESENTATION	APPLICATION
<ul style="list-style-type: none">a. During size up the fire fighter should consider the possibility of electrical hazardsb. Cannot reliably determine voltage2. Whenever electrical hazards are suspected, notify your ECC (Emergency Command Center) They will immediately begin the notification process with all responding units <p>NOTE: See Information Sheet #3</p> <ul style="list-style-type: none">3. ASSUME ALL WIRES TO BE ENERGIZED until you are told they are<ul style="list-style-type: none">a. DEADb. GROUNDED4. All wires should be considered to be electrically energized<ul style="list-style-type: none">a. Phone and television cables may be energized if contact has been made with electrical wires5. Avoid tunnel vision <p>C. Structure Fires</p> <ul style="list-style-type: none">1. If possible, wait for electrical utility personnel to arrive on scene<ul style="list-style-type: none">a. The only exception to this is when<ul style="list-style-type: none">(1) Life is in immediate danger(2) Rescue must be performed and	<p>Can you tell if a line has high voltage current?</p>

4331.2



Fire Protection Training

Procedures Handbook 4300

SAFETY PRECAUTIONS WHEN
WORKING NEAR ENERGIZED
ELECTRICAL EQUIPMENT

PRESENTATION	APPLICATION
<p>(3) You are well trained</p> <p>2. One of the best places to interrupt electrical service is at the service panel disconnect</p> <p>a. Trip main circuit breaker</p> <p>b. Remove fuses</p> <p>c. Do not remove meters</p> <p>NOTE: Blown fuses and tripped circuit breakers assist fire investigators in determining fire cause. Make a written note indicating which breakers are tripped or what fuses were blown before disconnecting or removing.</p> <p>3. Do not operate any switches or electrical devices if combustible vapors or gases are suspected</p> <p>4. Some older buildings have more than one disconnecting switch and the switches may serve only a portion of the building</p> <p>5. Many electric company customers have backup, auxiliary, or emergency power sources</p> <p>a. When the normal electrical supply is interrupted, the secondary electrical source may energize immediately or after a short time delay</p> <p>6. Only trained persons from the power company should attempt to cut power lines</p> <p>7. If visibility is poor, adequate lighting should be provided to ensure that all possible hazards can be seen and identified</p> <p>D. Exposures to Electrical Hazards</p>	

4331.2



Fire Protection Training

Procedures Handbook 4300

SAFETY PRECAUTIONS WHEN
WORKING NEAR ENERGIZED
ELECTRICAL EQUIPMENT

PRESENTATION	APPLICATION
<ol style="list-style-type: none">1. Extreme caution should be exercised when parking fire department vehicles at the scene of an emergency<ol style="list-style-type: none">a. Avoid parking beneath electrical lines2. If any part of a vehicle comes in contact with a potential electrical conductor the entire vehicle may become energized without the firefighters being aware of the condition<ol style="list-style-type: none">a. If for any reason, a vehicle is suspected of being energized, firefighters leaving the vehicle should "jump clear" if they must leave the vehicleb. Simultaneously contacting energized vehicle and the ground may have fatal consequencesc. Once safely off an electrically energized apparatus do not remount it3. Ground ladders should be located away from electrical service entrances and overhead wires<ol style="list-style-type: none">a. Extreme caution should be exercised while raising a ladder orb. Moving the ladder in the vertical positionc. Contrary to popular belief, wooden ladders do not provide adequate protection from electrical current<ol style="list-style-type: none">(1) The conductivity of wooden ladders is greatly increased if the ladder is dirty or wet4. Firefighters working on the roof of a building should be aware of	

4331.2



Fire Protection Training

Procedures Handbook 4300

SAFETY PRECAUTIONS WHEN
WORKING NEAR ENERGIZED
ELECTRICAL EQUIPMENT

PRESENTATION	APPLICATION
<ul style="list-style-type: none">a. Low hanging electrical lines above the roofb. Electrical lines below the roof level<ul style="list-style-type: none">(1) Care should be exercised when clearing debris from the roof or upper floors of the building <p>E. Water and Electricity</p> <ul style="list-style-type: none">1. Avoid contacting electrical lines with water streams<ul style="list-style-type: none">a. Water from hose line will conduct electricityb. A fog pattern is less likely to conduct electricity back to the firefighter than a straight stream2. The conductivity of water depends on its purity<ul style="list-style-type: none">a. Less pure - more conductivity <p>F. Energized Objects</p> <ul style="list-style-type: none">1. Since many utility poles support both electrical and telephone wires, assume that all wires are energized2. Fences, guardrails, and other metal structures may present a special hazard<ul style="list-style-type: none">a. If one end of a metal fence or guardrail becomes energized by a fallen wire, the entire length of fence or guardrail will be energized3. At the scene of fallen electrical lines, a danger zone should be established and a guard posted to ensure the safety of the public and firefighters	

4331.2



Fire Protection Training

Procedures Handbook 4300

SAFETY PRECAUTIONS WHEN
WORKING NEAR ENERGIZED
ELECTRICAL EQUIPMENT

PRESENTATION	APPLICATION
<p>4. The area should be flagged with black and yellow hazard flagging for a minimum radius of 25'</p>	

4331.2



Fire Protection Training

Procedures Handbook 4300

SAFETY PRECAUTIONS WHEN
WORKING NEAR ENERGIZED
ELECTRICAL EQUIPMENT

SUMMARY:

Electrical current can injure and kill, even at low voltages. By knowing and understanding the effects that electricity can have on the body, the Firefighter can develop a respect for electrical hazards. Electrically educated firefighters realize the potential hazards associated with electricity and can take effective measures to protect themselves and the public.

EVALUATION:

A written quiz.

ASSIGNMENT:

Read related information in IFSTA, Essentials of Fire Fighting.